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Issued December 27, 1912.

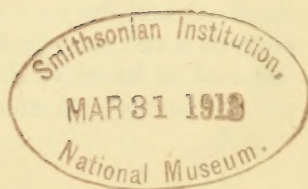
U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY—CIRCULAR No. 165.

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INSECTS LIABLE TO DISSEMINATION IN
SHIPMENTS OF SUGAR CANE.

BY

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United States Department of Agriculture,

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INTRODUCTION.

The danger of introducing injurious insects into the United States through the importation of promising varieties of sugar cane is so great and so often overlooked that a word of warning seems to be necessary. However desirable it may be to introduce new varieties of cane, the fact that injurious insects will probably be disseminated at the same time should be given due consideration. There is also a risk, though not so great, in transporting cane from one place to another in the United States, as is often done for grinding or planting purposes. All the sugar-cane insects in this country seem to be of only local distribution, so that any injurious insect may easily be spread over a larger area by shipments of cane. Sugar cane intended for grinding is probably not so perfect a medium for transporting insects as is cane which is to be planted, but if the cane for grinding is left waiting for some time it is probable that the insects within may emerge and infest standing cane near by. An injurious insect may in this way obtain a foothold in a new region.

To avoid the introduction of a new pest with a shipment of cane it is desirable to obtain the cane, if possible, at a point where injurious insects are not known to occur, and to grow the cane for the first year under the inspection of an entomologist. Shipments of sugar cane coming into the United States should be carefully examined at the port of entry, but sometimes there are borers within the cane which can not be detected unless the stalks are cut open and consequently spoiled. Gases which are ordinarily very efficient for fumigation seem to be unable to penetrate a stalk of cane, but it may be that dipping the cane in certain solutions will be found to be satisfactory. Experiments along these lines are now in progress.

Compared with the knowledge which has been gained of certain other insects, little is known concerning the species which trouble sugar cane. The reason for this lack of knowledge is that the scientific study of the various species is a very recent development, and the few workers in different parts of the world have not yet had time to make the required investigations. But the several species, with their respective forms of injury, have been differentiated and some of their life habits have been determined, so that more than sufficient knowledge has been obtained upon which to base a warning. The very fact that the measures for control are in many cases doubtful makes the warning even more urgent.

A list of species liable to dissemination by shipments of sugar cane has been compiled from published and unpublished notes which are on file at the office of the United States Bureau of Entomology at Audubon Park, New Orleans. The various species are considered as follows:

FOREIGN INSECTS.

THE LARGER MOTH BORER.

(*Castnia licus* Drury.)

Of the injurious insects which do not now occur in the United States the larger moth borer is perhaps most to be avoided. The injury to the cane by this species is even greater than that which is caused by the moth borer which we have in this country, and the larger species is still more difficult to control.

Prof. H. A. Ballou,¹ entomologist of the Imperial Department of Agriculture for the British West Indies, has published the following statement regarding the pest:

* * * The larva reaches a size of $2\frac{1}{2}$ inches in length and $\frac{1}{2}$ inch in diameter. The tunnel is consequently large and the injury to cane very severe. The pupal state is passed in the cane or in the soil near the underground portions. The time occupied in the life cycle ranges from 12 to 15 weeks. The adult insect is a large day-flying moth which in general appearance is very similar to the large butterflies.

Castnia licus is a native of South America. Its original food plants were species of the orchid family and of the family of plants to which the pineapple belongs (Bromeliaceæ). It is distributed over a large portion of the northern part of South America and extends northward to Mexico; it has been known in Trinidad for several years. In British Guiana it has been a serious cane pest in certain localities for a number of years, and in Trinidad it is known to attack sugar cane and bananas. It has also been reported, as a cane pest, from Surinam. It is not known at present to occur in any of the islands north of Trinidad, and every precaution should be taken to prevent its introduction into any of these islands. If cane plants are to be imported from any colony or country where this pest occurs, only the tops should be admitted, and these should be carefully examined for any signs of the eggs or larvæ at the base of the leaves. Cane trash should never be imported, on account of the possibility of

¹Insect Pests of the Lesser Antilles. By H. A. Ballou, M. Sc. Issued by the Commissioner of Agriculture. Barbados, 1912.

introducing the eggs. Any trash accidentally accompanying imported cane plants should be rigorously burned.

Control.—No satisfactory system of control has yet been devised for the larger moth borer. Collecting the moths by means of nets in the hands of children has given better results than any other direct measure of control that has been tried. Flooding the fields after the removal of the crop has had a good effect in certain instances, but this practice could not be carried out in most localities in the Lesser Antilles.

THE WEEVIL BORERS.

Next in importance come the weevil borers, of which there are several species. They are known in Cuba, Porto Rico, Hawaii, the British West Indies, and probably in South America and Mexico. It seems that one or two species may be recorded as rare in the United States. A note in the possession of the writer records a weevil as having been reared from young shoots of sugar cane which were collected at Fairview Plantation, Berwick, La., on April 28, 1910, by Mr. D. L. Van Dine. Mr. Van Dine found the larvæ just above the surface of the ground. Mr. E. R. Barber of this office states that he found pupæ of weevils in the sugar cane at Audubon Park, New Orleans, in 1911. During the early summer in 1912 the writer found weevil borers in the young sugar-cane plants at Audubon Park and at the experiment station at Brownsville, Tex. The weevils found at Brownsville were in the larval stage in dying plants of stubble cane, below the surface of the ground and near the point where the young shoot left the old stubble. In plant cane at Audubon Park the weevil larvæ were also found below the surface, and near the point where the young plant joined the seed cane. The larvæ were from one-eighth to one-fourth of an inch in length. Sometimes a borer was found in the middle of the stem, while in other cases the borers were near one side of the stem. The injury to the plant is like the "dead heart" caused by our moth borer. It seems probable that the moth borer is blamed for some of the injury caused by the weevils.

Very likely these borers have been introduced in shipments of sugar cane from the Tropics. They are small and their work is hard to find, so that they might easily have escaped the eye of the average person. So few of the weevils have been found up to date that there may be no occasion for alarm, while on the other hand they may increase in numbers so as to become a serious pest.

THE FROGHOPPERS.

Probably the greatest damage from froghoppers or spittle insects is suffered by the cane planters of the Island of Trinidad, near the coast of Venezuela. Froghoppers suck the juice from the cane plants. Remaining in one place on the plant they surround themselves with a coating of white froth, and because of this habit the popular name of spittle insects has been given to them. They are

small, winged creatures, and leap readily when disturbed. The froghoppers breed in cane fields which are damp and grassy. A good method of control is to keep the cane fields free from rank weeds and tall grass. A species of froghopper was found last summer on cane and grass near New Orleans by Mr. Gilbert E. Bodkin, Government economic biologist of British Guiana, who examined some cane fields in company with the writer. Specimens of these insects were sent to Dr. F. W. Urich, entomologist of Trinidad, who states that the species is not the same as the one which occurs in his vicinity. Dr. Urich writes as follows:

I would strongly advise you to make an effort to eradicate this insect from the grass surrounding cane fields, for if they get established in sugar canes there is no knowing what may happen. Our froghopper trouble originated in grass.

THE LEAFHOPPERS.

Apparently we have several leafhoppers in this country, but they do not seem to be injurious. In Hawaii, however, there is a destructive leafhopper (*Perkinsiella saccharicida* Kirkaldy) which was introduced from Queensland, Australia. The manner of introduction and dispersion is described in an interesting way by Mr. D. L. Van Dine¹ in the following words:

The main factor in the distribution of the pest is the habit of the female of depositing her eggs beneath the epidermis of the internodes of the cane stock. It seems probable that the pest was introduced into the islands and to a great extent distributed over the cane districts in seed cane. In local distribution other factors present themselves. The leafhopper is an insect readily attracted by light at night, as its presence about lamps in the factories and homes on the plantations testifies. Passengers and steamship officers of the interisland steamers have frequently stated to the writer on inquiry that in many instances, especially at night, great numbers of the insects have come aboard in certain ports or when offshore from certain plantation districts. These adults have undoubtedly traveled in this manner from one locality to another, so that an uninfested district might easily have become infested while stopping at or passing by an infested locality. Railway trains have been equally active in the spread of the insect on land.

Another mode of distribution during the general outbreak of 1903, under conditions of heavy infestation, was the migration of the pest from one locality to another during the daytime. These migrations were observed by many of the planters. The manager of one plantation in the Hamakua district of the island of Hawaii stated to the writer that in the early evening of April 26, 1903, the atmosphere was "thick with hoppers" for a distance of 2 miles and that the "hoppers" were traveling with the prevailing wind, about southwest. Similar migrations, described by the observers as "clouds," were mentioned by other managers.

The characteristic injury of this leafhopper is also noted by Mr. Van Dine:²

The presence of the pest on the plantations was noticed first by the appearance of a sooty black covering on the lower leaves of the cane plant. This black covering became known as smut. It is a fungous growth and finds a medium for development in the transparent, sticky fluid secreted by the leafhoppers during their feeding on the plant. This secretion is commonly known as honeydew.

¹ The Sugar-Cane Insects of Hawaii. By D. L. Van Dine. Bul. 93, Bureau of Entomology, U. S. Department of Agriculture, Washington, 1911.

² Previous reference.

The black smut or fungous growth in the honeydew secretion of the leafhopper and the red discoloration about the openings to the egg chambers in the midribs of the leaves are the most pronounced symptoms of the work of the leafhopper on cane.

When one considers that this pest was inadvertently transported from Australia to Hawaii, there is no reason to suppose that it could not be brought from Hawaii to the United States, more especially after the opening of the Panama Canal.

THE PINK MEALYBUG.

(*Pseudococcus sacchari* Ckll.)

The pink mealybug (*Pseudococcus sacchari* Ckll.) is not known to occur in the United States, though we have an allied species. It is a soft creature which infests the cane in a similar manner to the form which occurs in the United States, which is considered in another place in this publication. It occurs in Cuba, Porto Rico, South America, and probably elsewhere. We have received some specimens from Costa Rica.

THE WEST-INDIAN MOLE CRICKET.

(*Scapteriscus didactylus* Latr.)

The West Indian mole cricket (*Scapteriscus didactylus* Latr.) is recorded from the West Indies generally and from South America, but it is especially destructive in Porto Rico, where "it abounds over all the island and attacks practically all cultivated plants."¹ This insect burrows in the soil and feeds on the cane and other plants. Its peculiar life history makes it very difficult to control.

The omnivorous habit of the mole cricket of Porto Rico indicates that the sugar planter may not be the only one who will lose by the careless introduction of sugar cane. It seems possible, too, that insects not known to attack sugar cane but which attack other plants may be transferred from place to place in shipments of cane.

OTHER FOREIGN INSECTS.

There are many other insects of lesser importance that attack sugar cane in the Tropics, but it will hardly be necessary to consider them here except to state that an insect which is of little harm in one country may become surprisingly injurious if brought to another country. The reason for this is that in its native place a species usually has natural enemies of one kind or another which check its progress, while if the injurious species becomes established in a new home its enemies are seldom introduced with it and the harmful insect reaches its maximum development. Insects that are considered of little consequence by our tropical friends may become of almost tragic importance to us if we allow them to enter our borders.

¹ Second Annual Report of the Experiment Station (of the Sugar Producers' Association of Porto Rico) for the Year 1911-1912. Report of the Entomologist by D. L. Van Dine. Rio Piedras, P. R., 1912.

INSECTS OCCURRING IN THE UNITED STATES.

THE SUGAR-CANE MOTH BORER.

(Diatræa saccharalis Fab.)

The sugar-cane moth borer is easily the most important of the insects injurious to sugar cane in the United States. Like other sugar-cane insects it was probably introduced from the Tropics, though the time of this introduction is very uncertain.¹ The nature of injury is only too familiar to most planters. The adult, a small moth, deposits its eggs in clusters on the leaves of the cane plants. These eggs hatch, and the small larvæ, or borers, which emerge begin to gnaw their way into the stalk. The injury in the early spring is known as "dead heart," and consists of the decaying of the tender shoot of the young plant. This is caused by the inner tissues being severed by the borer near the surface of the ground. Later in the season the borer is found in the stalks of cane, in which it gnaws irregular tunnels.

Mr. T. C. Barber² has made an investigation of the actual loss directly due to the moth borer, and he summarizes his results in these words:

The sugar-cane borer damages cane in the field by destroying a considerable percentage of the eyes, thus reducing the stand of plant cane; by stunting the growth of the cane, owing to the physical injury of the stem; by admitting fungous diseases through the wounds in the stem, and is the main cause of injury by the wind, owing to the weakening of the stalk due to the tunnels and burrows. These classes of injury have been appreciated by planters. It now develops that there is another and very important class of injury which has been overlooked. This is the reduction of both the quantity and quality of the juice, which is dealt with specially in this circular. It becomes evident that both the planters and the manufacturers are vitally interested in the work of the sugar-cane borer.

The distribution of the moth borer seems to be limited, in a general way, to the southern half of Louisiana and the lower Rio Grande Valley in Texas. The infestation is not uniform, but is affected by local conditions. Our notes indicate that the moth borer is not to be found at Sugarland and Victoria, Tex.; at Biloxi and Hattiesburg, Miss.; nor at Montgomery and Selma, Ala. This matter should be further investigated, however, as we have not had the opportunity to examine very many fields at any of the places mentioned. Where the moth borer is not known to occur the planters should be very careful in bringing in shipments of cane from other communities.

¹ Cane borer (*Diatræa saccharalis*). Report of investigations by W. C. Stubbs, director, and H. A. Morgan, entomologist. Bulletin of the Agricultural Experiment Station, second series, No. 70. Baton Rouge, La., 1902.

² Damage to Sugar Cane in Louisiana by the Sugar Cane Borer. By T. C. Barber. Circular 139, Bureau of Entomology, U. S. Department of Agriculture. Washington, 1911.

THE GRAY MEALYBUG.

(Pseudococcus calceolariae Mask.)

Another insect which has entered the United States from the Tropics is the mealybug, or "pou-a-pouche," as it is often called in Louisiana. We have here called it the gray mealybug to distinguish it from the pink one which is considered under "Foreign Insects." Mr. J. B. Garrett¹ made a study of the mealybug some years ago, and we quote his statement concerning its history in Louisiana:

Just how long the sugar-cane mealybug has been in Louisiana and from whence it came is problematical. Information received from some of the oldest cane planters in southern Louisiana indicates that the insect was imported on seed cane about 25 years ago and became established on some of the plantations near the mouth of the Mississippi River. From this point it has worked its way north to the district around New Orleans. Dr. Wm. C. Stubbs, formerly director of the Louisiana Experiment Stations, states that the mealybug made its first appearance at the Sugar Experiment Station at Audubon Park, New Orleans, in 1891. It did not become established at the station from this introduction for the reason that all infested canes were taken up and burned. Several years later a second introduction to the Sugar Experiment Station plats occurred. Because of the great value of the varieties infested, it became more practical to attempt control and exercise precautions in the distribution of seed cane than to take the rigid measures of eradication. These measures would have meant the destruction of the varieties in practically all of the station plats with the reintroduction from outside almost a certainty. This would have been an irreparable loss to the station and of no protection to the planter since the pest is well established in the surrounding plantations.

The mealybug may be recognized on the cane plant by the mealy or floury secretion by which it is surrounded. The insect attaches itself to the stalk of cane and sucks the juice. Its greatest injury is in killing the buds of windrowed or other cane, causing a low percentage of germination the following year. It is limited to a certain area in Louisiana, especially to plantations along the Mississippi River. The writer found an infestation of the mealybug at the experiment station at Brownsville, Tex., in October, 1912, and he advised those in charge to take every means of eradicating the pest.

THE SUGAR-CANE APHIDID.

An aphidid or plant louse was found this year (1912) by the writer at a number of places in southern Louisiana and near Harlingen, Tex. It appears to be a species new to science as well as to most sugar planters. Its importance is doubtful, as we have practically no information about it.

¹ A Preliminary Report on The Sugar-Cane Mealy-Bug. By J. B. Garrett. Agricultural Experiment Station of the Louisiana State University and A. and M. College. Baton Rouge, La., 1910.

OTHER INSECTS OCCURRING IN THE UNITED STATES.

We have considered the weevil borers as foreign insects, but as they have already been found in the United States they may sooner or later force us to give them a place among our own species.

There are some injurious beetles, and one species seems to be confined to a certain part of Louisiana. During this year no definite records have been obtained regarding them.

Still other insects which are more or less injurious to sugar cane occur in this country, but they do not deserve mention in this paper. There may be still others of which we have no knowledge, for extensive field examinations have been made only during this year. The information which has been obtained, however, indicates the need for further investigations.

CONCLUSION.

The fact that the principal insects injurious to sugar cane in the United States seem to have been inadvertently introduced from the Tropics indicates the necessity for more careful inspection of shipments of sugar cane entering this country. Indeed, most extraordinary efforts would be justified to prevent the introduction of other pests. As to the insects which we now have, it is evident that they are found only in certain places and that they are more abundant in some places than in others. The fullest information is needed, therefore, regarding their present occurrence. Otherwise, the planter, in seeking to benefit himself by bringing in a shipment of seed cane from some outside point, may really occasion loss to himself and his neighbors. The pest which has once become established presents a problem to the planter and the entomologist, and a period of many years may be too short a time to solve some of the problems with which we already have to deal. But if means are provided for keeping out the injurious insects altogether the work will be correspondingly simplified and the planters and manufacturers may be saved many thousands of dollars.

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